# Master Thesis

**Thema:**

**Numerical Studies on the Behavior of Cast Piles in Soft Clays under Seismic Loadings**

**Motivation:**

The renewal of the map series on earthquake hazard in Germany lead to the fact that more locations are assigned to an earthquake risk class. In practice, this means that more and more buildings need to be designed to withstand earthquakes. Some pile foundation systems that are common in practice are currently, due to the legislation, not allowed to undertake horizontal forces, and thus there is no design format for horizontal loadings. One such example is the cast pile. For these reason a numerical study on the behaviour of casts pile under earthquake loadings will show how large the expected shear forces in the piles are.

Bild 1: Manufacture of a cast pile

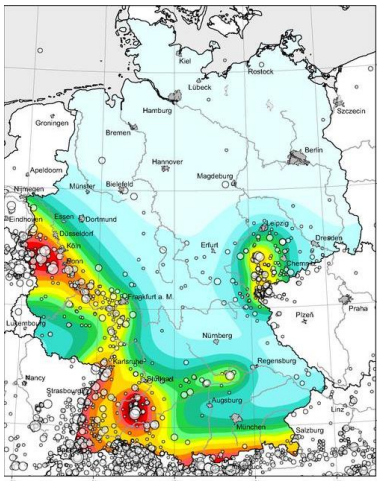


Bild 2: Map for Earthquake hazard

**Task:**

The aim of this work is the numerical investigation of cast piles under seismic loading.

For this purpose, an existing 1D numerical model of the Soil-Structure-Interaction will be used in pile foundations.

First of all, a literature search on the use and modelling of piles smaller diameter (micropiles, cast piles) under horizontal and earthquake loads should be performed. Constructive aspects, such as the connection between the piles and the structure, should also be considered.

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Then the calculation model should be used to recalculate the dynamic response of a model cast pile. Various typical building ground scenarios with fine-grained and coarse-grained soils are to be considered:

1. Piles float in a fine-grained or coarse-grained soil layer

2. Piles bind in a load-bearing layer, which is overlaid by a fine-grained layer

3. As in case 1, but the fine-grained layer is overlaid by a coarse-grained top layer

4. As in case 2, but the fine-grained layer is overlaid by a coarse-grained top layer

In these scenarios, the influences of the decisive input parameters on the deformations and the internal forces of the individual pile are to be examined. The parameters to be examined include the essential soil parameters (shear modulus G and Poisson's ratio v), the pile diameter and pile length as well as the earthquake-induced subsoil movements. The latter result from the simulation of the propagation of the earthquake waves in the subsoil. At the end, the application limits of the model should be summarized and recommendations for use in practice should be made

**Special requirements :**

Good knowledge of soil mechanics and dynamics and ideally knowledge of using MathCad

**Supervisor:**


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